dynamically generating a feature amount of a recognition candidate pattern string using feature amounts of patterns during a recognition process; and

collating the generated feature amount of the pattern string with a feature amount of a recognition target.

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13. (As Once AMENDED) A recognizing method, comprising:

generating a list of at least one pattern string;

generating a dictionary for storing feature amounts of a plurality of patterns;

dynamically generating a feature amount of a pattern string stored in said list using feature amounts of patterns stored in said dictionary during a recognition process; and

collating the generated feature amount of the pattern string with a feature amount of a recognition target.

REMARKS

In the Office Action mailed February 26, 2001, claims 1, 5, 7, 8, and 13 were rejected under 35 USC § 102(b) as being anticipated by Lyon (U.S. Patent No. 5,675,665), claims 9-12 were rejected under 35 USC § 102(e) as being anticipated by Nakao et al. (U.S. Patent No. 6,064,769), claim 2 was rejected under 35 USC § 103(a) as being unpatentable over Lyon, claims 3, 4, and 6 were rejected under 35 USC § 103(a) as being unpatentable over Lyon in view of Kimura et al. (Patent Recognition Journal: 7; Improvement of Handwritten Japanese Character Recognition Using Weighted Direction Code Histogram), and claim 4 was rejected under 35 USC § 103(a) as being unpatentable over Lyon further in view of Kimura et al. and Tsuruoka et al. (IEEE Paper ISBN: 0-8186-4960-7; Segmentation and Recognition for Handwritten 2-Letter State Names). The foregoing rejections are respectfully traversed.

Claims 1-13 are pending in the subject application, of which claims 1, 9-13 are independent claims. Claims 2-8 depend, either directly or indirectly, from claim 1.

Claims 1 and 9-13 are amended herein. Care has been exercised to avoid the introduction of new matter. Support for the amendments to claims 1 and 13 is found in the

application as filed, and, more particularly, in the present specification, page 8, at lines 3-8. Support for the amendments to claims 9-12 is found in the application as filed, and, more particularly, in the present specification, page 7 at lines 14-15 and page 8 at lines 3-8.

Claims 2-8 are amended for clarification.

A Version with Markings to Show Changes Made to amended claims 1-13 is included herewith.

Lyon

Lyon discloses a word recognition system which measures character sizes and placements. To distinguish characters which resemble each other, such as O (uppercase alphabetic character) and 0 (a number); and S (uppercase alphabetic character), s (lowercase alphabetic character) and, 5 (a number), which are considered impossible to distinguish only by the single character recognition approach, Lyon uses comparative size and position information of characters as to make the distinction. With the Lyon system, from results of an initially performed character recognition, error values are generated for all the candidate character pairs, where the error values are to describe relative positions of boundary rectangles, and the best character pair is selected.

As Figs. 17A-17B of Lyon disclose, firstly plural candidate characters are generated by performing a character recognition for an unknown word (510). Then another recognition process is performed, in which a set of model data comprising character sizes and relative positions information is referenced for each of all the possible pairs of neighboring characters (512). At this step 512, as shown in Fig. 13 of Lyon, the model data for each of the character pairs and the model data of the unknown word are compared and the most likely candidate character pair is selected.

The Lyon apparatus assumes characters are always separated correctly from a word and a character recognition candidate set always contains a correct one. Therefore, the Lyon system, in advance, must be provided with model data for all the possible candidate pairs of characters and must accept that the variety of recognizable words are limited. With the Lyon apparatus, the model data for a candidate character pair are not dynamically generated in the course of a recognition process.

Nakao

Nakao et al. is concerned with a character recognition system. According to Figs. 4A and 4B of Nakao, after a word rectangle is extracted, a character evaluation using a character recognition dictionary is performed and the results are output. In the Action, the Examiner relies upon Figs. 5A, 5B, 46A, 46B, and 47-49, and on col. 35 (lines 40-67) and col. 36 (lines 1-33), which reviews the fundamental and publicly-known process associated with the character recognition technology, i.e., extracting characters in a form separated to a single characters from a string of characters, performing a recognition process and outputting the recognition candidates together with corresponding respective evaluation values.

A word rectangle, extracted with the Nakao system, corresponds to a word of a recognition target but does not designate a word to which the recognition target is compared. The word rectangles in the Nakao system are used merely for defining character sets subjected respectively to a recognition process, and the actual recognition process is performed for each character in the word rectangles. The Nakao system does not compare between the feature amount of a recognition target and that of a word.

Kimura

Kimura et al. is concerned with a recognition method for handwritten Japanese characters using a weighted direction code histogram.

Tsuruoka

Tsuruoka et al. is concerned with segmentation of two-letters state names (that is, abbreviated expressions of state names), and proposes a solution to the problem associated with a discriminant analysis method of finding a separation line for a pair of letters with which the letter width differs greatly between each other, such as with "IN". In Section 3.2, Tsuruoka proposes a criterion for removing correctly narrow width letters such as "I". The criterion suggested constitutes a new evaluation function, the core concept of which may be referred to as "adding a correction term" to place a high priority to locations at

which the projection histogram becomes 0. This criterion for the character splitting, however, has no similarity with the area division performed for calculating the direction code histogram of contour lines of a pattern.

Lyon and Kimura

The Examiner's combining of Lyon with the direction code histogram system of Kimura et al. is respectfully traversed. The size and the displacement amount of characters are feature amounts completely different from the direction code histogram series and, thus, it is not possible to combine the size and the direction code histogram series of Kimura with the system of Lyon.

However, if Lyon and Kimura were to be combined, the combination of Lyon and Kimura would be a word recognition system which measures character sizes and placements, for handwritten Japanese characters using a weighted direction code histogram.

Lyon, Kimura, and Tsuruoka

As stated herein above, the Examiner's combining of Lyon with the direction code histogram system of Kimura et al. is respectfully traversed. The size and the displacement amount of characters are feature amounts completely different from the direction code histogram series and, thus, it is not possible to combine the size and the direction code histogram series of Kimura with the system of Lyon.

However, if Lyon and Kimura were to be combined, the combination of Lyon, Kimura, and Tsuruoka is a word recognition system which measures character sizes and placements, for handwritten Japanese characters using a weighted direction code histogram, segmenting 2-letter names.

Present Invention

In contrast to the foregoing references relied upon, the present invention overcomes the difficult problem of separating a handwritten word into discrete characters by providing a way of recognizing a word without separating the word into discrete characters. The system

of the present invention is configured so that a list of words likely to be entered is introduced to the system based on preliminary knowledge (for instance, a hierarchical structure of address words), a feature amount for each of the words likely to be included in the list is dynamically generated, and the word identification function is performed.

The present invention does not assume the kind of pre-requisite information required by the Lyon apparatus. The present invention generates dynamically a feature amount of a word from feature amounts of characters along with a recognition process. In this way, the present invention reduces the required memory size extends the range of recognizable words.

More particularly, apparatus claim 1 and method claim 13 of the present application each recites (using the recitation of claim 1 as an example) "a generating unit dynamically generating a feature amount of a word stored in said listing unit using the feature amounts of characters stored in said dictionary unit during a recognition process".

Moreover, apparatus claims 9 and 10, and medium claims 11 and 12, of the present application each recites (using the recitation of claim 9 as an example) "a generating unit dynamically generating a feature amount of a recognition candidate word using feature amounts of characters during a recognition process".

In addition, dependent claims 2-8 recite patentably distinguishing features of their own. For example, claim 2 recites "said collating unit includes a memory storing the feature amount of the word, and releases the memory when a collation of the feature amount of the word is completed".

Withdrawal of the foregoing rejections is respectfully requested.

Moreover, the draftsperson objected to Figures 4, 9, and 10 on Form PTO-948 which accompanied the Action. Copies of Figures 4, 9, and 10, as originally filed, are re-submitted in the Re-Submission of Drawings filed concurrently herewith, for review under the "scan-ability" standard for Figures.

CONCLUSION

There being no other objections or rejections, it is submitted that the application is in condition for allowance, which action is earnestly solicited.

If any further fees are required in connection with the filing of this Amendment, please charge same to our Deposit Account No. 19-3935.

Respectfully submitted,

STAAS & HALSEY LLP

By: _____

Gene M. Garner II
Registration No. 34,172

700 Eleventh Street, N.W.
Suite 500
Washington, D.C. 20001
Telephone: (202) 434-1500
Facsimile: (202) 434-1501

Date: May 25, 2001

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS

Please **AMEND** the claims as follows:

1. (ONCE AMENDED) A word recognizing apparatus, comprising:

a listing [means for] unit storing a list of at least one word;

a dictionary [means for] unit storing feature amounts of a plurality of characters;

a generating [means for] unit dynamically generating a feature amount of a word stored in said listing [means] unit using the feature amounts of characters stored in said dictionary [means] unit during a recognition process; and

a collating [means for] unit collating the generated feature amount of the word with a feature amount of a recognition target, and outputting a recognition result.

2 (ONCE AMENDED) The word recognizing apparatus according to claim 1, wherein said collating [means] unit includes a memory [means which stores] storing the feature amount of the word, and releases the memory [means] when a collation of the feature amount of the word is completed.

3. (ONCE AMENDED) The word recognizing apparatus according to claim 1, further comprising:

an inputting [means for] unit inputting an image as the recognition target; and

an extracting [means for] unit performing a one-dimensional graduating conversion in a direction perpendicular to a connecting direction of characters for a direction code histogram of a contour line in each of a plurality of small areas in an inputted image and extracting a direction code histogram series obtained from a conversion result as the feature amount of the recognition target.

4. (ONCE AMENDED) The word recognizing apparatus according to claim 3, wherein said extracting [means] unit divides a length of the inputted image in the direction

perpendicular to the connection direction of characters by a predetermined integer and divides the image into the small areas with an obtained quotient as a size of each of the small areas.

5. (ONCE AMENDED) The word recognizing apparatus according to claim 1, wherein said generating [means] unit generates the feature amount of the word by using feature amounts of a plurality of characters.

6. (ONCE AMENDED) The word recognizing apparatus according to claim 5, wherein said generating [means] unit generates a new direction code histogram series by arranging a plurality of direction code histogram series corresponding to the feature amounts of characters composing the word and designating a generated direction code histogram series as the feature amount of the word.

7. (ONCE AMENDED) The word recognizing apparatus according to claim 1, wherein said collating [means] unit performs a non-linear matching of the feature amount of the word and the feature amount of the recognition target, and calculates a degree of similarity between the feature amount of the word and the feature amount of the recognition target.

8. (ONCE AMENDED) The word recognizing apparatus according to claim 1, wherein said listing [means] unit stores a list which has a high possibility of containing a word corresponding to the recognition target.

9. (ONCE AMENDED) A word recognizing apparatus, comprising:

a generating [means for] unit dynamically generating a feature amount of a recognition candidate word using feature amounts of characters during a recognition process; and

a collating [means for] unit collating the generated feature amount of the word with a feature amount of a recognition target, and [for] outputting a recognition result.

10. (ONCE AMENDED) A recognizing apparatus, comprising:

a generating [means for] unit dynamically generating a feature amount of a recognition candidate pattern string using feature amounts of patterns during a recognition process; and

a collating [means for] unit collating the generated feature amount of the pattern string with a feature amount of recognition target, and [for] outputting a recognition result.

11. (ONCE AMENDED) A computer-readable storage medium on which is recorded a program causing a computer to execute a process, said process comprising [the steps of]:

dynamically generating a feature amount of a recognition candidate word using feature amounts of characters during a recognition process; and

collating the generated feature amount of the word with a feature amount of a recognition target.

12. (ONCE AMENDED) A computer-readable storage medium on which is recorded a program causing a computer to execute a process, said process comprising [the steps of]:

dynamically generating a feature amount of a recognition candidate pattern string using feature amounts of patterns during a recognition process; and

collating the generated feature amount of the pattern string with a feature amount of a recognition target.

13. (ONCE AMENDED) A recognizing method, comprising [the steps of]:

generating a list of at least one pattern string;

generating a dictionary for storing feature amounts of a plurality of patterns;

dynamically generating a feature amount of a pattern string stored in said list using feature amounts of patterns stored in said dictionary during a recognition process; and

collating the generated feature amount of the pattern string with a feature amount of a recognition target.